

# Claims

[c1] What is claimed is:

1. A data slicer comprising:  
a comparator coupled with an input signal and a reference signal for generating a sliced signal;  
a waveform generator for generating a calibration signal;  
a pulse extension device coupled to the comparator and the waveform generator for modifying the duty cycle of either the sliced signal or the calibration signal to output;  
a charge pump coupled between the pulse extension device and a first node for charging and discharging the first node according to a signal output from the pulse extension device;  
a determining circuit for adjusting the data slicer according to the level change at the first node; and  
a feedback device coupled between the first node and the comparator for generating the reference signal.

[c2] 2. The data slicer of claim 1 further comprising:

a multiplexer coupled with the comparator, the waveform generator, and the pulse extension device for selectively outputting the sliced signal or the calibration

signal to the pulse extension device.

- [c3] 3. The data slicer of claim 2 further comprising:
  - an integrator coupled with the first node; and
  - an analog-to-digital converter (ADC) coupled between the integrator and the determining circuit.
- [c4] 4. The data slicer of claim 3 wherein when the multiplexer outputs the calibration signal to the pulse extension device, the determining circuit compares the output values of the ADC at two different time instants  $N_1 \cdot T_C$  and  $N_2 \cdot T_C$  to determine how to adjust the data slicer, where  $T_C$  represents the period of the calibration signal and  $N_1$  and  $N_2$  are integers.
- [c5] 5. The data slicer of claim 3 wherein the pulse extension device is for receiving the sliced signal or the calibration signal and modifying their duty cycles in order to generate a first modifying signal and a second modifying signal.
- [c6] 6. The data slicer of claim 5 wherein the pulse extension device comprises:
  - a pulse extender coupled with the multiplexer for receiving the sliced signal or the calibration signal and modifying their duty cycles in order to generate the first modifying signal; and

an inverter coupled with the pulse extender for generating the second modifying signal inverse to the first modifying signal.

[c7] 7. The data slicer of claim 6 wherein the determining circuit is coupled to the pulse extender for adjusting the pulse extender.

[c8] 8. The data slicer of claim 5 wherein the pulse extension device comprises:

a first pulse extender coupled with the multiplexer for receiving the sliced signal or the calibration signal and modifying their duty cycles in order to generate the first modifying signal;

an inverter coupled with the multiplexer for receiving the sliced signal or the calibration signal and outputting them after inversion; and

a second pulse extender coupled with the inverter for receiving the inverted version of the sliced signal or the calibration signal and modifying their duty cycles in order to generate the second modifying signal.

[c9] 9. The data slicer of claim 8 wherein the determining circuit is coupled to the first pulse extender for adjusting the first pulse extender.

[c10] 10. The data slicer of claim 8 wherein the determining

circuit is coupled with the second pulse extender for adjusting the second pulse extender.

[c11] 11. The data slicer of claim 5 wherein the charge pump is a tunable charge pump.

[c12] 12. The data slicer of claim 5 wherein the charge pump comprises:

a first tunable charge pump unit coupled between the pulse extension device and the first node for charging the first node according to the first modifying signal; and a second tunable charge pump unit coupled between the pulse extension device and the first node for discharging the first node according to the second modifying signal.

[c13] 13. The data slicer of claim 12 wherein the first tunable charge pump unit comprises:

a tunable current source; and  
a first switch coupled between the tunable current source and the first node for charging the first node according to the first modifying signal.

[c14] 14. The data slicer of claim 13 wherein the determining circuit is coupled with the tunable current source for adjusting the tunable current source.

[c15] 15. The data slicer of claim 12 wherein the second tunable charge pump unit comprises:

a tunable current sink; and  
a second switch coupled between the tunable current sink and the first node for discharging the first node according to the second modifying signal.

- [c16] 16. The data slicer of claim 15 wherein the determining circuit is coupled with the tunable current sink for adjusting the tunable current sink.
- [c17] 17. The data slicer of claim 3 wherein the pulse extension device is for receiving the sliced signal or the calibration signal to modify its duty cycle in order to generate a first modifying signal.
- [c18] 18. The data slicer of claim 17 wherein the pulse extension device comprises:  
a pulse extender coupled with the multiplexer for receiving the sliced signal or the calibration signal to modify its duty cycle in order to generate the first modifying signal.
- [c19] 19. The data slicer of claim 18 wherein the determining circuit is coupled to the pulse extender for adjusting the pulse extender.
- [c20] 20. The data slicer of claim 17 wherein the charge pump is a tunable charge pump.

[c21] 21.The data slicer of claim 17 wherein the charge pump comprises:

    a first tunable charge pump unit coupled between the pulse extension device and the first node for charging the first node according to the first modifying signal; and

    a second tunable charge pump unit coupled between the pulse extension device and the first node for discharging the first node according to the first modifying signal.

[c22] 22.The data slicer of claim 21 wherein the first tunable charge pump unit comprises:

    a tunable current source; and

    a first switch coupled between the tunable current source and the first node for charging the first node according to the first modifying signal.

[c23] 23.The data slicer of claim 22 wherein the determining circuit is coupled with the tunable current source for adjusting the tunable current source.

[c24] 24.The data slicer of claim 21 wherein the second tunable charge pump unit comprises:

    a tunable current sink; and

    a second switch coupled between the tunable current sink and the first node for discharging the first node according to the first modifying signal.

- [c25] 25.The data slicer of claim 24 wherein the determining circuit is coupled with the tunable current sink for adjusting the tunable current sink.
- [c26] 26.The data slicer of claim 1 wherein the feedback device is a low pass filter.